

# The Light company

Houston Lighting & Power South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

May 29, 1997

ST-HL-AE-5650

File No.: G26

10CFR50.73

STI: 30279653

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

South Texas Project  
Unit 2  
Docket No. STN 50-499  
Licensee Event Report 97-006  
Regarding a Manual Reactor Trip  
Due to Malfunctioning Main Feedwater Regulating Valve

Pursuant to 10CFR50.73, South Texas Project submits the attached Unit 2 Licensee Event Report 97-006 regarding a manual reactor trip due to a malfunctioning Main Feedwater Regulating Valve. This event did not have an adverse effect on the health and safety of the public.

If you should have any questions on this matter, please contact Mr. S. M. Head at (512) 972-7136 or me at (512) 972-7988.

*for* *M. E. Masse*  
R. E. Masse  
Plant Manager,  
Unit 2

*1/1*  
*LC22*

KJT/

Attachment: LER 97-006 (South Texas, Unit 2)

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S PDR



Houston Lighting & Power Company  
South Texas Project Electric Generating Station

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Page 2

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NRC FORM 308  
(4-95)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104  
EXPIRES 04/30/98

# LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS  
MANDATORY INFORMATION COLLECTION REQUEST 500 HRS.  
REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE  
LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD  
COMMENTS REGARDING BURDEN ESTIMATE TO THE  
INFORMATION AND RECORDS MANAGEMENT BRANCH (T-8 F33),  
U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC  
20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1)

South Texas, Unit 2

DOCKET NUMBER (2)

05000 499

PAGE (3)

1 OF 4

TITLE (4)

Manual Reactor Trip due to Malfunctioning Main Feedwater Regulating Valve

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
04	30	97	97	-- 006	-- 00	05	29	97		05000
									FACILITY NAME	DOCKET NUMBER
										05000
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)										
OPERATING MODE (9)			20 2201(b)		20 2203(a)(2)(v)		50 73(a)(2)(i)		50 73(a)(2)(vii)	
POWER LEVEL (10)			20 2203(a)(1)		20 2203(a)(3)(i)		50 73(a)(2)(u)		50 73(a)(2)(x)	
			20 2203(a)(2)(i)		20 2203(a)(3)(ii)		50 73(a)(2)(w)		73.71	
			20 2203(a)(2)(ii)		20 2203(a)(4)		X 50 73(a)(2)(w)		OTHER	
			20 2203(a)(2)(iii)		50 36(c)(1)		50 73(a)(2)(v)		Specify in Abstract below or in NRC Form 308A	
			20 2203(a)(2)(iv)		50 36(c)(2)		50 73(a)(2)(vi)			

## LICENSEE CONTACT FOR THIS LER (12)

NAME

Scott M. Head -Licensing Supervisor

TELEPHONE NUMBER (Include Area Code)

(512) 972-7136

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS
X	JB	CBD	W120	YES					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES  
(If yes, complete EXPECTED SUBMISSION DATE).

X NO

EXPECTED  
SUBMISSION  
DATE (15)

MONTH DAY YEAR

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On April 30, 1997, Unit 2 was operating at 100% power in Mode 1. At approximately 2150 hours on April 30, 1997, feedwater flow oscillation to the 2D Steam Generator was observed. Attempts to manually control 2D Main Feedwater Regulating Valve resulted in erratic response. With 2D Steam Generator level at 35% and decreasing, the reactor was manually tripped at 2158 hours on April 30, 1997. All control rods fully inserted. The Engineered Safeguards Features System actuated the Auxiliary Feedwater System and Feedwater Isolation as expected for a reactor trip. All safety equipment operated as designed. The cause of this occurrence was a failure of two integrated circuits in the 2D Main Feedwater Regulating Valve automatic control circuit and a hairline crack in the solder run leading to a resistor in the manual control circuit. Corrective actions included replacing the 2D Main Feedwater Regulating Valve controller-driver card and testing the control circuit satisfactorily, and performing alignment checks of the Main Feedwater Regulating Valve controller-driver cards in each Unit 2 train prior to unit restart.



NRC FORM 366A (4-95)		U.S. NUCLEAR REGULATORY COMMISSION	
<b>LICENSEE EVENT REPORT (LER)</b> <b>TEXT CONTINUATION</b>			
<b>FACILITY NAME (1)</b>	<b>DOCKET</b>	<b>LER NUMBER (5)</b>	<b>PAGE (3)</b>
South Texas, Unit 2	05000 499	YEAR	2 OF 4
		SEQUENTIAL NUMBER	
		97 -- 006 -- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**DESCRIPTION OF EVENT:**

On April 30, 1997, Unit 2 was operating at 100% power in Mode 1. At approximately 2150 hours on April 30, 1997, feedwater flow oscillation to the 2D Steam Generator was observed. Manual control of the 2D Main Feedwater Regulating Valve was attempted and resulted in a zero feedwater demand signal with indication of decreasing feedwater flow to 2D Steam Generator. Attempts to manually increase or decrease the demand signal to 2D Main Feedwater Regulating Valve resulted in erratic behavior. With 2D Steam Generator level at 35% and decreasing, the reactor was manually tripped at 2158 hours on April 30, 1997. All control rods fully inserted. The Engineered Safeguards Features System actuated the Auxiliary Feedwater System and Feedwater Isolation as expected for a reactor trip. All safety equipment operated as designed.

Troubleshooting determined that the 2D Main Feedwater Regulating Valve position followed controller demand. It was observed that with the 2D Main Feedwater Regulating Valve controller in manual and with a demand signal raised to 50%, the demand signal would continue to increase beyond the 50% signal although the manual control pushbutton had been released. The same anomalous controller behavior was observed with a decrease demand signal. These observations indicated the 2D Main Feedwater Regulating Valve Westinghouse 7300 Series controller-driver card malfunctioned.

A replacement controller-driver card was installed and the 2D Main Feedwater Regulating Valve controller responded as designed. Investigation determined that the malfunctioned controller-driver card had two failed integrated circuits in the counter and comparator portion of the control circuit causing the automatic mode failure of the 2D Main Feedwater Regulating Valve. It was also discovered that the malfunctioned controller-driver card had a hairline crack in the solder run leading to a resistor in the manual control circuit. This caused the manual mode failure of the 2D Main Feedwater Regulating Valve.

A review of the same type of 7300 Series controller-driver card used in other South Texas Project systems was conducted. This review concluded that a failure of the controller-driver card in these other systems would not lead to a reactor trip. A failure would result in a slowly developing transient that could be controlled by application of Off-Normal Operating Procedures or could be mitigated by redundant equipment.

Control circuits for South Texas Project Main Feedwater Regulating Valves are susceptible to single point failures. Approximately three years previous to this occurrence, preventive maintenance activities were initiated to detect impending card failures in the Main Feedwater Regulating Valve control circuits. South Texas Project plans to evaluate potential further enhancements to preventive maintenance activities using industry and site-specific data to improve card reliability. In addition, South Texas Project has performed a Main Feedwater Regulating Valve control circuit loop evaluation and is evaluating potential design changes to make the Main Feedwater Regulating Valve control circuit less susceptible to single point failures.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (8)
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South Texas, Unit 2	05000 499	97	006	00	3 OF 4

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**CAUSE OF EVENT:**

The cause of this occurrence was a failure of two integrated circuits in the 2D Main Feedwater Regulating Valve automatic control circuit and a hairline crack in the solder run leading to a resistor in the manual control circuit on the same controller card.

**ANALYSIS OF EVENT:**

Reactor Trips and Engineered Safeguards Features Actuations are reportable pursuant to 10CFR50.73(a)(2)(iv). The reactor was brought to an orderly shutdown. Engineered Safeguards Features functioned as designed. There were no adverse safety or radiological consequences of this event.

**CORRECTIVE ACTION:**

1. The 2D Main Feedwater Regulating Valve controller-driver card was replaced and the control circuit tested satisfactorily.
2. Alignment checks of the Main Feedwater Regulating Valve controller-driver cards in each Unit 2 train were performed satisfactorily prior to unit restart.
3. The Main Feedwater Regulating Valve controller-driver cards in each Unit 1 train will be replaced with newly aligned cards prior to the completion of the next Unit 1 refueling outage.

In addition to the above corrective actions, the following activities are being conducted to reduce the probability of a similar occurrence in the future:

- evaluation of potential further enhancements to preventive maintenance activities using industry and site-specific data to improve card reliability.
- evaluation of potential design changes to make the Main Feedwater Regulating Valve control circuit less susceptible to single point failures.



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(4-85)LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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South Texas, Unit 2	05000 499	97	006	00	4 OF 4

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**ADDITIONAL INFORMATION:**

The failed circuit card is a Westinghouse 7300 controller-driver type NCD3.

A previous similar event described in Licensee Event Report 92-010 for Unit 2 resulted from the failure of a Westinghouse 7300 Series driver card. The power supply and the primary clock counter were determined to be the specific components whose failure led to the loss of card output.

Unit 1 Licensee Event Report 94-009 described a manual reactor trip due to a malfunctioning Main Feedwater Regulating Valve. A failed transformer coil in the torque motor in the current to pneumatic convertor caused a malfunction of the Main Feedwater Regulating Valve.